DETAILED ACTION

Response to Amendment

1. Claims 1, 3, 4, and 6-8 are currently pending. Claims 2, 5, and 9-26 are cancelled. The previous objection to claim 1 is withdrawn. The previous 112, 2nd paragraph rejection of claims 1 and 3 is withdrawn. The amended claims do overcome the previously stated 103 rejections. However, upon further consideration, claims 1, 3, 4, and 6-8 are rejected under the following new 103 rejections. This action is made FINAL as necessitated by the amendment.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 9/15/08 was filed after the mailing date of the non-final rejection on 3/28/08. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanizaki et al (JP 4-274174) in view of Strang (US 2003/0019580), and further in view of Guay (US 2005/0058879).

The Tanizaki reference discloses a shutter mechanism for controlling reactants in a direct methanol fuel cell system, having at least one fuel cell "1" including a membrane electrode assembly, comprising: a fuel source, an anode current collector "39" disposed generally at the anode reaction layer "33b", a cathode current collector "39" disposed generally at the cathode reaction layer "36b", shutter plate "7" disposed within the fuel cell between a source of a reactant and the membrane electrode assembly, wherein the shutter plate has through-holes "6" that correspond with through-holes "8" on anode collector plate "10" such that when the shutter plate is placed adjacent to the anode collector plate, the flow of the reactant is controlled (See page 7, Working Example 1 and Figure 1). It also discloses a shutter plate that is placed between a fuel source and the anode catalyst layer "33b" (See Figures 1 and 5).

However, Tanizaki et al does not expressly teach a moving component having a plurality of laterally displaced protrusions, wherein the moving component is adjustable in a direction perpendicular to the plane in which the component is disposed, such that when it is adjusted, the component travels generally in a z-axis within a vapor gap, closer to or further away from an anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell; and the anode current collector formed with a plurality of laterally displaced openings corresponding to the plurality of laterally displaced protrusions, such that when moving component is placed

adjacent to the receiving element, the flow of the reactant is controlled, wherein the moving component is configured such that when the moving component is adjusted to a closed position, the protrusions interconnect with the openings in the anode current collection to substantially seal the openings, and the moving component also having apertures therein interspersed with the protrusions in such a manner that when the moving component is in a open position, the apertures allow for flow of fuel therethrough to the membrane electrode assembly.

The Strang reference discloses an apparatus that enables the adjustment of the mass flow rate through a plurality of bores comprising: a freely moving plug plate “154” arranged parallel to and spaced apart from an inject plate “124”, wherein the plug plate comprises a plurality of plugs (protrusions) “160” and a plurality of apertures “156” through which gas may pass that are interspersed with the plugs, wherein each plug extends into a respective bore (opening) “166” formed in the inject plate “124”, and wherein the plug plate is adjustable in a direction perpendicular to the plane in which the plug plate is disposed via displacement actuators “170” (See paragraph [0053],[0055] and Figure 3(a)).

Examiner’s note: It is inherent that when the plug plate is adjusted to a closed position, the plugs interconnect with the bore to substantially seal the bores and when the plug plate is adjusted in an open position, the apertures allow for the flow of gas therethrough. In addition, the Strang reference is relevant to the Tanizaki reference and the applicant's field of endeavor because it solves the same problem of controlling the flow of a gas through a plurality of openings.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki shutter plate to include a moving component having a plurality of laterally displaced protrusions, wherein the moving component is adjustable in a direction perpendicular to the plane in which the component is disposed, such that when it is adjusted, the component travels generally in a z-axis within a vapor gap, closer to or further away from an anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell; and the anode current collector formed with a plurality of laterally displaced openings corresponding to the plurality of laterally displaced protrusions, such that when moving component is placed adjacent to the receiving element, the flow of the reactant is controlled, wherein the moving component is configured such that when the moving component is adjusted to a closed position, the protrusions interconnect with the openings in the anode current collection to substantially seal the openings, and the moving component also having apertures therein interspersed with the protrusions in such a manner that when the moving component is in a open position, the apertures allow for flow of fuel therethrough to the membrane electrode assembly in order to provide an uniform gas flow through the openings of an receiving component. In addition, the substitution of a known mechanism for controlling a gas flow for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

However, Tanizaki et al as modified by Strang does not expressly teach a fuel cell that has a smaller size for use with a mobile phone, laptop, or handheld computer.

The Guay reference discloses a direct methanol fuel cell incorporated into power sources for portable electronic devices (See paragraphs [0003]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki/Strang fuel cell to include a smaller size for use with a mobile phone, laptop, or handheld computer in order to utilize the fuel cell in practical applications while providing longer runtimes.

5. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanizaki et al (JP 4-274174) in view of Strang (US 2003/0019580).

The Tanizaki reference discloses a shutter mechanism for controlling reactants in a direct methanol fuel cell system, having at least one fuel cell "1" including a membrane electrode assembly, comprising: a fuel source, an anode current collector "39" disposed generally at the anode reaction layer "33b", a cathode current collector "39" disposed generally at the cathode reaction layer "36b", shutter plate "7" disposed within the fuel cell between a source of a reactant and the membrane electrode assembly, wherein the shutter plate has through-holes "6" that correspond with through-holes "8" on anode collector plate "10" such that when the shutter plate is placed adjacent to the anode collector plate, the flow of the reactant is controlled (See page 7, Working Example 1 and Figure 1). It also discloses a shutter plate that is placed between a fuel source and the anode catalyst layer "33b" (See Figures 1 and 5).

However, Tanizaki et al does not expressly teach a moving component having a plurality of laterally displaced protrusions, wherein the moving component is adjustable in a direction perpendicular to the plane in which the component is disposed, such that

when it is adjusted, the component travels generally in a z-axis within a vapor gap, closer to or further away from an anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell; and the anode current collector formed with a plurality of laterally displaced openings corresponding to the plurality of laterally displaced protrusions, such that when moving component is placed adjacent to the receiving element, the flow of the reactant is controlled, wherein the moving component is configured such that when the moving component is adjusted to a closed position, the protrusions interconnect with the openings in the anode current collection to substantially seal the openings, and the moving component also having apertures therein interspersed with the protrusions in such a manner that when the moving component is in a open position, the apertures allow for flow of fuel therethrough to the membrane electrode assembly.

The Strang reference discloses an apparatus that enables the adjustment of the mass flow rate through a plurality of bores comprising: a freely moving plug plate “154” arranged parallel to and spaced apart from an inject plate “124”, wherein the plug plate comprises a plurality of plugs (protrusions) “160” and a plurality of apertures “156” through which gas may pass that are interspersed with the plugs, wherein each plug extends into a respective bore (opening) “166” formed in the inject plate “124”, and wherein the plug plate is adjustable in a direction perpendicular to the plane in which the plug plate is disposed via displacement actuators “170” (See paragraph [0053],[0055] and Figure 3(a)).

Examiner's note: It is inherent that when the plug plate is adjusted to a closed position, the plugs interconnect with the bore to substantially seal the bores and when the plug plate is adjusted in an open position, the apertures allow for the flow of gas therethrough. In addition, the Strang reference is relevant to the Tanizaki reference and the applicant's field of endeavor because it solves the same problem of controlling the flow of a gas through a plurality of openings.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki shutter plate to include a moving component having a plurality of laterally displaced protrusions, wherein the moving component is adjustable in a direction perpendicular to the plane in which the component is disposed, such that when it is adjusted, the component travels generally in a z-axis within a vapor gap, closer to or further away from an anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell; and the anode current collector formed with a plurality of laterally displaced openings corresponding to the plurality of laterally displaced protrusions, such that when moving component is placed adjacent to the receiving element, the flow of the reactant is controlled, wherein the moving component is configured such that when the moving component is adjusted to a closed position, the protrusions interconnect with the openings in the anode current collection to substantially seal the openings, and the moving component also having apertures therein interspersed with the protrusions in such a manner that when the moving component is in a open position, the apertures allow for flow of fuel therethrough to the membrane electrode assembly in order to

provide an uniform gas flow through the openings of an receiving component. In addition, the substitution of a known mechanism for controlling a gas flow for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

However, Tanizaki et al as modified by Strang does not expressly teach a fuel cell that has a smaller size for use with a mobile phone, laptop, or handheld computer. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki/Strang fuel cell to include a smaller size for use with a mobile phone, laptop, or handheld computer because changes in size were held to be obvious (*In re Rose* 105 USPQ 237 (CCPA 1955)).

6. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanizaki et al (JP 4-274174) in view of Guay (US 2005/0058879), and further in view of Strang (US 2003/0019580).

The Tanizaki reference discloses a shutter mechanism a direct methanol fuel cell system comprising: a fuel source and a fuel cell “1” that includes a proton conductive membrane “35” having reaction layers “33b” & “36b” on each of its major surfaces; an anode current collector “39” disposed generally at the anode reaction layer “33b”; a cathode current collector “39” disposed generally at the cathode reaction layer “36b”; a movable shutter plate “7” disposed within the fuel chamber “32” between a source of a reactant and the anode current collector such that when the movable shutter plate is adjustable to substantially or partially prevent fuel flow through the anode current collector to the anode reaction layer of the fuel cell; and a load coupled between the

anode current collector and the cathode current collector for utilizing the electricity generated by the fuel cell (See paragraphs [0002],[0005],[0016] and Figure 1 and 5).

However, Tanizaki et al does not expressly teach a passive mass transport barrier disposed generally between the fuel source and the anode aspect and spaced from the anode aspect to define a vapor gap in the fuel cell, wherein the passive mass transport barrier controls the rate of fuel delivery to the catalyzed anode aspect of the fuel cell; or a fuel cell that has a smaller size for use with a mobile phone, laptop, or handheld computer. The Guay reference discloses an enhanced planar vaporization membrane "44" disposed in a vapor chamber between the fuel source and the anode catalyst layer of the fuel cell that controls the rate of fuel delivery to the anode catalyst layer of the fuel cell; and a fuel cell that is incorporated into power sources for portable electronic devices (See paragraphs [0003],[0060],[0061]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki fuel cell system to include a passive mass transport barrier disposed generally between the fuel source and the anode aspect and spaced from the anode aspect to define a vapor gap in the fuel cell, wherein the passive mass transport barrier controls the rate of fuel delivery to the catalyzed anode aspect of the fuel cell and to include a fuel cell that has a smaller size for use with a mobile phone, laptop, or handheld computer in order to deliver vapor phase of methanol fuel at higher rates to enable higher power DMFC systems and to utilize a power source that has longer runtimes due to the ability to use high-energy content fuels.

However, Tanizaki et al as modified by Guay does not expressly teach a movable shutter plate having a plurality of laterally displaced protrusions disposed within the vapor gap between the passive mass transport barrier and the anode current collector which forms a plurality of laterally displaced openings corresponding to the plurality of laterally displaced protrusions, wherein when the movable plate is adjusted to a closed position, the protrusions interconnect with the openings in the anode current collector to substantially seal the openings, and the movable plate also having apertures therein interspersed with the protrusions in such a manner that when the movable plate is in an open position, the apertures allow for flow of fuel therethrough, wherein the movable plate is adjustable in a direction perpendicular to the plane in which the plate is disposed, such that when it is adjusted, the plate travels generally in a z-axis within the vapor gap, closer to or further away from the anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell; and protrusions that have angled sides, wherein the openings in the anode current collector are correspondingly angled such that the protrusions interconnect securely within the angled openings of the current collector to substantially seal the openings against fuel flow.

The Strang reference discloses an apparatus that enables the adjustment of the mass flow rate through a plurality of bores comprising: a freely moving plug plate “154” arranged parallel to and spaced apart from an inject plate “124”, wherein the plug plate comprises a plurality of plugs (protrusions) “160” and a plurality of apertures “156” through which gas may pass that are interspersed with the plugs, wherein each plug

extends into a respective bore (opening) “166” formed in the inject plate “124”, and wherein the plug plate is adjustable in a direction perpendicular to the plane in which the plug plate is disposed via displacement actuators “170” (See paragraph [0053],[0055] and Figure 3(a)). It also discloses plugs “160” with angled sides, wherein the bores “166” are correspondingly angled such that the plugs interconnect securely within the angled bores to substantially seal the bores against gas flow (See Figure 3J).

Examiner’s note: It is inherent that when the plug plate is adjusted to a closed position, the plugs interconnect with the bore to substantially seal the bores and when the plug plate is adjusted in an open position, the apertures allow for the flow of gas therethrough. In addition, the Strang reference is relevant to the Tanizaki reference and the applicant's field of endeavor because it solves the same problem of controlling the flow of a gas through a plurality of openings.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki/Guay shutter plate to include a movable shutter plate having a plurality of laterally displaced protrusions disposed within the vapor gap between the passive mass transport barrier and the anode current collector which forms a plurality of laterally displaced openings corresponding to the plurality of laterally displaced protrusions, wherein when the movable plate is adjusted to a closed position, the protrusions interconnect with the openings in the anode current collector to substantially seal the openings, and the movable plate also having apertures therein interspersed with the protrusions in such a manner that when the movable plate is in an open position, the apertures allow for flow of fuel therethrough, wherein the

movable plate is adjustable in a direction perpendicular to the plane in which the plate is disposed, such that when it is adjusted, the plate travels generally in a z-axis within the vapor gap, closer to or further away from the anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell; and protrusions that have angled sides, wherein the openings in the anode current collector are correspondingly angled such that the protrusions interconnect securely within the angled openings of the current collector to substantially seal the openings against fuel flow in order to provide an uniform gas flow through the openings of an receiving component. In addition, the substitution of a known mechanism for controlling a gas flow for another would have yielded predictable results to one of ordinary skill in the art at the time of the invention.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanizaki et al (JP 4-274174) in view of Guay (US 2005/0058879) and Strang (US 2003/0019580) as applied to claim 4 above, and further in view of Fukano et al (US 2003/0102032).

However, Tanizaki et al as modified by Guay and Strang does not expressly teach protrusions that are substantially comprised of a compliant material that is compressed into the openings when the movable plate is adjusted to a closed position. The Fukano reference discloses a valve plug “102 that is made of a flexible material such as a resin material or a rubber material that opens/closes the fluid passage by separating from a seat section “106” (See paragraphs [0046],[0047] and Figure 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki/Guay/Strang fuel cell system to

include protrusions that are substantially comprised of a compliant material that is compressed into the openings when the movable plate is adjusted to a closed position in order to utilize a material that forms a stronger seal around the openings when the movable plate is adjusted to a closed position.

Examiner's note: The Fukano reference is relevant to the Tanizaki reference, Guay reference, Strang reference, and the applicant's field of endeavor because it solves the same problem of controlling the flow of a fluid from an inlet to an outlet.

8. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanizaki et al (JP 4-274174) in view of Guay (US 2005/0058879) and Strang (US 2003/0019580) as applied to claim 4 above, and further in view of Griffin (US 2003/0213519).

However, Tanizaki et al as modified by Guay and Strang does not expressly teach a coating disposed on the sides of the protrusions in the movable plate which further secures sealing of the anode current collector against fuel flow therethrough. The Griffin discloses a valve plug "148" that has a vulcanized rubber coating "148A" on the exterior of the valve plug (See paragraph [0055]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Tanizaki/Guay/Strang fuel cell system to include a coating disposed on the sides of the protrusions in the movable plate in order to provide a fluid-tight seal against the openings of the anode current collector.

Examiner's note: The Griffin reference is relevant to the Tanizaki reference, Guay reference, Strang reference, and the applicant's field of endeavor because it solves the same problem of controlling the flow of a fluid from an inlet to an outlet.

Response to Arguments

9. Applicant's arguments filed 6/30/08 have been fully considered but they are not persuasive.

The applicant argues that Tanizaki and Strang taken alone or in combination do not teach or suggest applicant's claimed novel moving component having a plurality of laterally displaced protrusions, wherein said moving component is adjustable in a direction perpendicular to the plane in which the component is disposed, such that when it is adjusted, the component travels generally in a z-axis within a vapor gap, closer to or further away from an anode current collector, to control fuel flow while not consuming substantially additional volume within the fuel cell and to allow for the fuel cell to have a smaller size for use with a mobile phone, laptop, or handheld computer and said moving component also having apertures therein interspersed with said protrusions in such a manner that when said moving component is in an open position, said apertures allow for flow of fuel therethrough to the membrane electrode assembly.

In response, the Strang reference clearly teaches the concept of a moving component (plug plate 154) that is adjustable in a direction perpendicular to the plane in which the component is disposed with apertures "156" therein interspersed with the protrusions "160" such that when the moving component is in an open position, the apertures allow for flow therethrough. Therefore, Strang does teach all of the structural limitations of the current application's shutter mechanism.

The applicant further argues that there is no motivation to combine Tanizaki and Strang. In response to applicant's argument that there is no suggestion to combine the

references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the motivation to combine is found in the Strang reference which is to provide more uniform gas flow through the openings of the receiving component.

The applicant further argues that Tanizaki teaches away from applicant's claimed novel invention by teaching laterally moving/sliding shutter plates. The examiner disagrees that Tanizaki teaches away from the applicant's claimed novel invention because there is no teaching in Tanizaki of any disadvantages of other types of shutter mechanisms.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571)272-0717. The examiner can normally be reached on M-F, 9:00AM to 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

/Jonathan Crepeau/
Primary Examiner, Art Unit 1795